

MicroCast: Additive Manufacturing of Metal Plus Insulator Structures with Sub-mm Features, Phase I

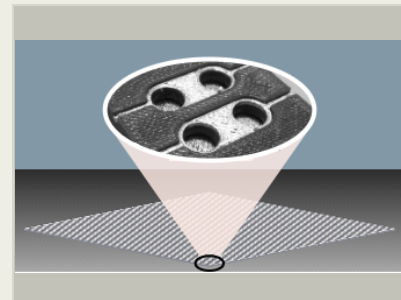
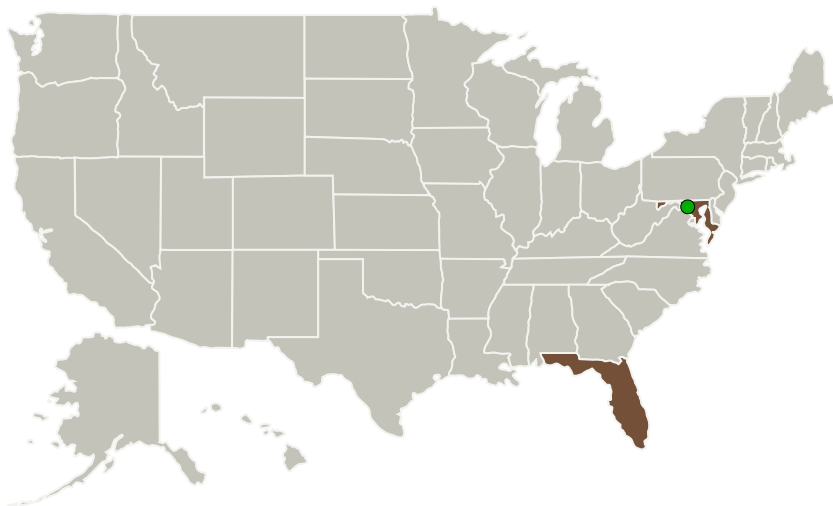
Completed Technology Project (2014 - 2014)



Project Introduction

A novel method for fabricating electronics containing both metals and polymers can be adapted to quickly and effectively produce micro-well sensors. The process revolves around creating a polymeric part through additive manufacturing, leaving voids and trace capillaries. Once the polymer structures are completed, molten metal is injected into these trace capillaries, which create a path to the voids in the printed parts. Capillary forces cause the liquid metal to wick into the capillary channels, filling the voids before solidifying. Unlike competing metal additive manufacturing techniques, the parts can be created with 100% dense metal elements that have low surface roughness and are completely compatible with the surrounding polymer. The proposed objective is to adapt the process specifically for the fabrication of the micro-well detectors required by the AdEPT mission. The overall objective of this proposal is to develop the liquid metal injection process for use with the high-resolution additive manufacturing methods made available through the UCF team, in order to allow for the creation of metal/polymer parts with sub-mm features. A further goal of the program will be to generalize the process in order to expand into other NASA projects, as well as enable a variety of commercial products.

Primary U.S. Work Locations and Key Partners



MicroCast: Additive Manufacturing of Metal Plus Insulator Structures with Sub-mm Features Project Image

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Organizations Performing Work	Role	Type	Location
Made in Space, Inc.	Lead Organization	Industry	JACKSONVILLE, Florida
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

Primary U.S. Work Locations

Florida	Maryland
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Project Transitions

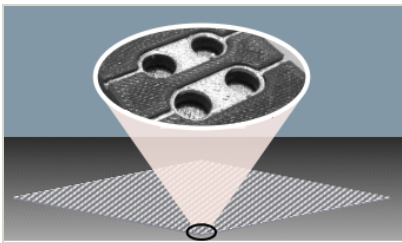
▶ **June 2014:** Project Start

✓ **December 2014:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137672>)

Images



Project Image

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(<https://techport.nasa.gov/image/130212>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Made in Space, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

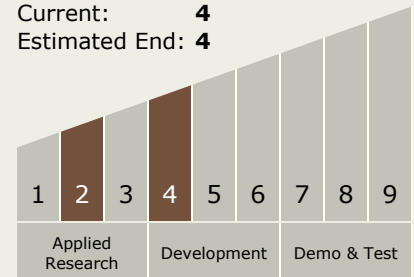
Carlos Torrez

Principal Investigator:

Jan Clawson

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System